CS 381

1. Po-Ying Chao

2. Jui-Hung Lu

3. Chih- Hsiang Wang

4. Chi Wen

5. Han-Yu Wu

Exercise 1

[]

[x:?] push

[y:?, x:?] push

[y:1, x:?]

[f{}, y:1, x:?] push

[x:2, f{}, y:1, x:?] push

[x:1, x:2, f{}, y:1, x:?] push

[x:0, x:1, x:2, f{}, y:1, x:?] push

[x:0, x:1, x:2, f{}, y:1, x:?]

[x:1, x:2, f{}, y:2, x:?] pop

[x:2, f{}, y:5, x:?] pop

[f{}, y:5, x:5] pop

[y:5, x:5] pop

[]

Exercise 2

(a) static scoping:

1 [x:?]

2 [y:?, x:?]

3 [z:?, y:?, x:?]

4 [z:?, y:?, x:3]

5 [z:?, y:7, x:3]

6 [f{}, z:?, y:7, x:3]

7 [y:?, f{}, z:?, y:7, x:3]

8 [y:11, f{}, z:?, y:7, x:3]

9 [g{}, y:11, f{}, z:?, y:7, x:3]

10 [y:?, g{}, y:11, f{}, z:?, y:7, x:3]

11 [y:13, g{}, y:11, f{}, z:?, y:7, x:3]

9 [x:2, y:13, g{}, y:11, f{}, z:?, y:7, x:3]

6 [y:11, x:2, y:13, g{}, y:11, f{}, z:?, y:7, x:3]

12 [y:13, g{}, y:11, f{}, z:33, y:7, x:3]

z = 33

(b) dynamic scoping:

1 [x:?]

2 [y:?, x:?]

3 [z:?, y:?, x:?]

4 [z:?, y:?, x:3]

5 [z:?, y:7, x:3]

6 [f{}, z:?, y:7, x:3]

7 [y:?, f{}, z:?, y:7, x:3]

8 [y:11, f{}, z:?, y:7, x:3]

9 [g{}, y:11, f{}, z:?, y:7, x:3]

10 [y:?, g{}, y:11, f{}, z:?, y:7, x:3]

11 [y:13, g{}, y:11, f{}, z:?, y:7, x:3]

9 [x:2, y:13, g{}, y:11, f{}, z:?, y:7, x:3]

6 [y:13, x:2, y:13, g{}, y:11, f:{}, z:?, y:7, x:3]

12 [y:13, g{}, y:11, f{}, z:26, y:7, x:3]

z = 26

Exercise 3

(a) call-by-name:

13 >>

8 [x:y\*2, g:{}, f{}, z:?, y:7]

9 >>

4 [a:x+1, x:y\*2, g{}, f{}, z:?, y:7]

5 [a:x+1, x:y\*2, g{}, f{}, z:?, y:16]

6 [res:49, a:x+1, x:y\*2, g{}, f{}, z:?, y:16]

<<

9 [x=y\*2, g={}, f={}, z=?, y=50]

10 >>

4 [a:x-y+3, x:y\*2, g{}, f{}, z:?, y:50]

5 [a:x-y+3, x:y\*2, g{}, f{}, z:?, y:54]

6 [res:111, a:x-y+3, x:y\*2, g{}, f{}, z:?, y:54]

<<

10 [x:y\*2, g{}, f{}, z:111, y:54]

11 [res:112, x:y\*2, g{}, f{}, z:111, y:54]

<<

13 [g{}, f{}, z:112, y:54]

y = 54

z = 112

(b) call-by-need:

13 >>

8 [x:y\*2, g:{}, f{}, z:?, y:7]

9 >>

4 [a:x+1, x:y\*2, g{}, f{}, z:?, y:7]

5 [a:15, x:14, g{}, f{}, z:?, y:16]

6 [res:31, a:15, x:15, g{}, f{}, z:?, y:16]

<<

9 [x=14, g={}, f={}, z=?, y=32]

10 >>

4 [a:x-y+3, 14, g{}, f{}, z:?, y:32]

5 [a:-15, x:14, g{}, f{}, z:?, y:-14]

6 [res:-29, a:-15, x:14, g{}, f{}, z:?, y:-14]

<<

10 [x:14, g{}, f{}, z:-29, y:-14]

11 [res:-28, x:14, g{}, f{}, z:-29, y:-14]

<<

13 [g{}, f{}, z:-28, y:-14]

y = -14

z = -28